TABLE 2.—*Frequency of tropical cyclones (West Indian hurricanes), 1871–1928*

Year	June	July	August	September	October	November	Total	Smoothed numbers
1871	1 (?)		2		1 (?)		4 (?)	
1872							0	1.5
1873			1		1		2	1.2
1874				1			1	1.2
1875				1			1	1.2
1876				1	1		2	2.0
1877				2	1		3	2.7
1878				1	2		3	2.7
1879			1		1		2	2.5
1880			3				3	2.5
1881			1	1			2	2.2
1882				1	1		2	2.5
1883			2	1	1		4	3.0
1884				1	1		2	2.5
1885			1	1			2	3.5
1886	2		4	1	1		8	6.5
1887			3	3	2		8	7.7
1888			1	3	2	1	7	6.7
1889			1	2	2		5	4.5
1890			1				1	4.2
1891		1	2	3	4		10	6.0
1892			1	1	1		3	6.2
1893	1	1	4	1	2		9	6.5
1894			1	1	3		5	5.0
1895					1		1	2.7
1896		1		3			4	2.2
1897							0	1.7
1898			1	2			3	2.2
1899			1	1	1		3	2.5
1900				1			1	2.0
1901		1	2				3	2.0
1902					1		1	2.2
1903		1	1	2			4	3.2
1904				1	2	1	4	3.5
1905				1	1		2	2.7
1906				2	1		3	2.0
1907							0	1.5
1908		1		2			3	2.5
1909		1	1	1	1		4	3.2
1910				1	1		2	2.2
1911			1				1	1.7
1912				1	1	1	3	1.7
1913							0	0.7
1914							0	0.7
1915				3			3	4.0
1916		3	4		2	1	10	6.2
1917				2			2	4.2
1918			1	2			3	2.5
1919				2			2	2.2
1920				2			2	2.7
1921	1			3	1		5	4.5
1922			3	2	1		6	5.2
1923				3	1		4	4.7
1924			2	1	1	1	5	4.2
1925			1	1		1	3	4.2
1926		1	2	2	1		6	4.0
1927			1				1	3.0
1928			3	1			4	
Sum	5	11	53	68	44	6	187	

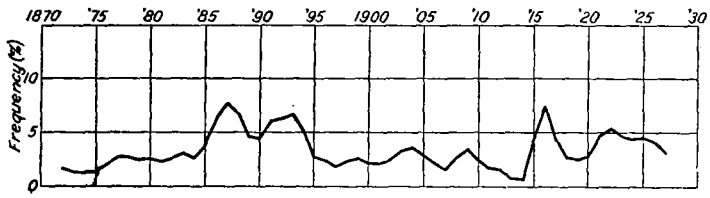

FIGURE 1.—Frequency of tropical cyclones, 1871–1928

I have plotted the smoothed annual number in Table 2 to form the curve in Figure 1. The smoothing process $\frac{(a+2b+c)}{4}$ tends to shift the epochs of maximum or minimum a year, or more, in extreme cases ahead or behind the true date and to reduce the amplitude of the oscillations from year to year; thus the greatest number of storms in any one year occurred in 1891 and 1916. In the first named the maximum was preceded by a year with but a single storm and followed with a year having but three, hence the smoothed value comes out as seven and the year of maximum for the three years is displaced forward to 1893. The chief maximum, 3-year periods considered, occurred in 1886–1888, but the total number of storms in any one of these years was not so great as in 1891 or 1916. There also seems to have been a secondary maximum in the three years 1921–1923. No storms of hurricane intensity occurred in 1907, 1913, and 1914.

DISCUSSION

By Dr. O. L. FASSIG

One interesting result of your list is fixing the culmination of the storm period in September, with August and October nearly equal in storm frequency and again July and November.

I have just completed a study of hurricanes affecting Porto Rico. The results are shown in the accompanying chart (fig. 2). You will see that our storms are also decidedly most frequent in September. I have endeavored to classify Porto Rican storms on a basis of intensity as affecting Porto Rico—dividing them into three classes. Class A includes all storms whose centers passed directly over the island and embraced the entire island within the central area of hurricane winds; of this class there were only two in 30 years, namely 1899 and 1928. Class B, numbering six storms, includes all storms in which some portion of Porto Rico was within the area of hurricane winds—i. e., winds of 75 miles or more per hour. In Class C, Porto Rico fell entirely outside the central area of hurricane winds, but within the area of moderately high winds accompanied by heavy rains. Class C may be called beneficial hurricanes, as the economic value of the rainfall far exceeded all losses by wind.

YEAR \ MONTH	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	ANNUAL
1899								A	C				2
1900								C	C				2
01							C						1
02	INTENSITY												
03	CLASS A - GENERALLY DESTRUCTIVE.												
04	CLASS B - LOCALLY												
05	DESTRUCTIVE WITH												
06	BENEFICIAL RAINS.								B				1
07	CLASS C - LIGHT LO-												
08	CAL LOSSES WITH								C				1
09	BENEFICIAL RAINS.							B					
10	CLASS A, 10%								B				
11	CLASS B, 30%												
12	CLASS C, 60%												
13													
14													
15								B					1
16								B		C			2
17									C				1
18													
19									C				1
20													
21									C				1
22									C				1
23													
24								C					1
25													
26							B		C				2
27													
28									A				1
SUMS							2	6	11	1			20
MEANS	(% OF TOTAL ANNUAL)						10	30	55	5			

FIGURE 2.—Distribution of tropical cyclones in Porto Rico

During the period from 1899 to 1930, Porto Rico had 2 overwhelmingly destructive storms; 6 storms with heavy local losses, combined with beneficial general

rains; 11 storms causing insignificant losses by wind compared with the great benefits to crops and municipal water supplies.

The historic storms of August 8, 1899, and September 13, 1928 (known respectively as San Ciriaco and San Felipe) occurred at the beginning and at the end of the 30-year period. The storms of secondary destructive force (class B) occurred as follows: July, 1926; August, 1909, 1915, 1916; September, 1906, 1910.

An inspection of the accompanying chart (fig. 2) showing the time distribution of hurricanes of Porto Rico will show that the 12 "beneficial" hurricanes (class C) comprise 60 per cent of the total number of cyclonic storms recorded in the past 30 years; that 6, or 30 per cent (class B) seriously affected only certain portions of the island and that 2, or 10 per cent (class A) brought not only general destruction to crops and homes, but involved heavy loss of life.

Combining all classes we have 10 per cent of the storms occurring in July, 30 per cent in August, 55 per cent in September, and 5 per cent in October. The period of 30 years is too short to give these percentages a dependable value, they may however be regarded as rough measures of frequency and intensity for Porto Rico.

We may disregard class C as a cause for alarm. Considering only classes A and B: (*a*) There has been no single year with more than one storm; (*b*) the 6-year period 1900 to 1905, the 4-year period 1911 to 1914, and the 9-year period 1917 to 1925 were without storms of even moderate violence.

THE WEST COAST ATMOSPHERIC FAULT[1]

551.51 (79)

By EDWARD H. BOWIE

[Weather Bureau, San Francisco, Calif., July 29, 1929]

Meteorologists have heard often and read much in recent years of surfaces of discontinuity in the earth's atmosphere. The Bjerknes school of meteorology has done much to bring them to the attention of meteorologists and to define their significance in the causation of our major atmospheric phenomena.

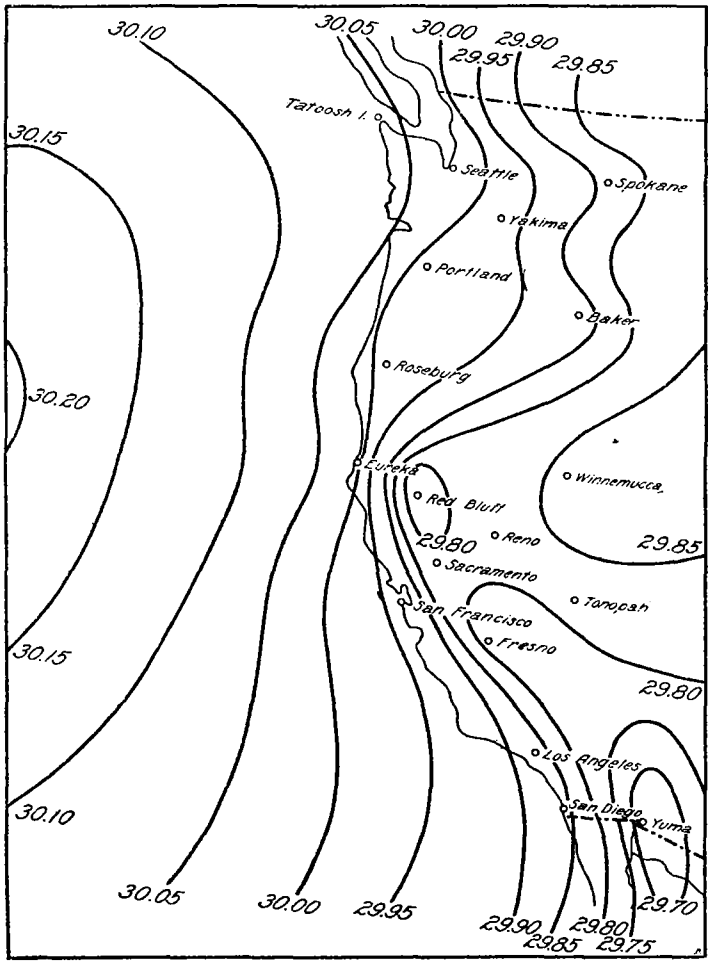

FIGURE 1.—Average sea-level pressure at 5 p. m. third decade of July

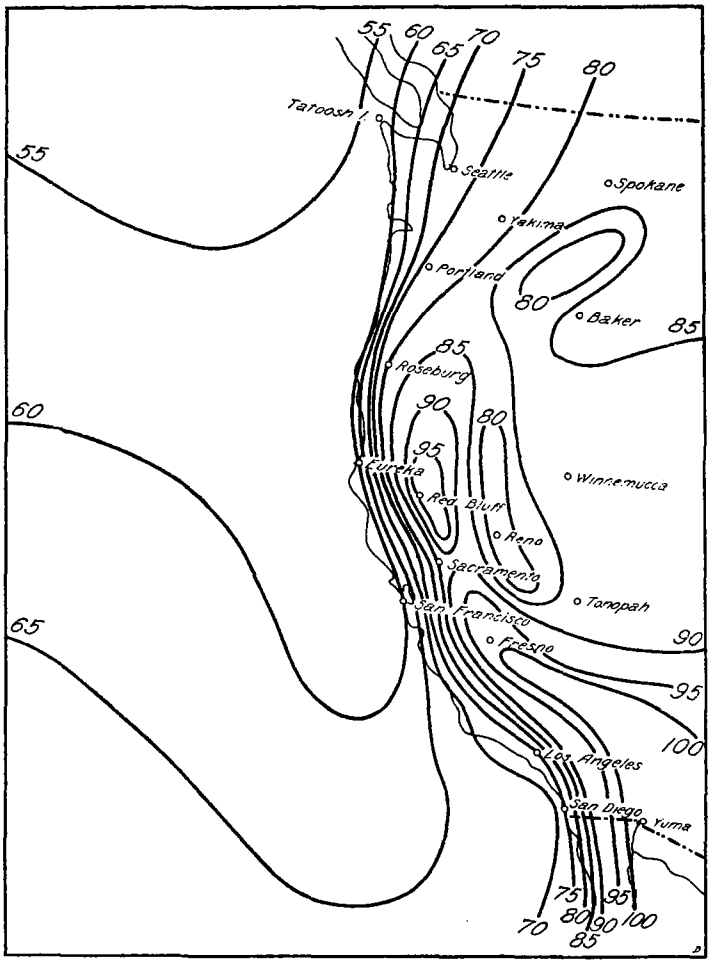

FIGURE 2.—Average air temperature at 5. p. m. third decade of July

Meteorologists have heard often and read much in recent years of surfaces of discontinuity in the earth's atmosphere. The Bjerknes school of meteorology has done much to bring them to the attention of meteorologists and to define their significance in the causation of our major atmospheric phenomena.

The Bjerknes school of meteorologists asserts that all of our cyclones occur on the discontinuities that intersect the earth's surface. Of these there are three major ones—(1) that separating the lower stratum, the troposphere, from the upper stratum, the stratosphere; (2) the boundary between the trades and the antitrades of the Tropics; and (3) the so-called "polar front" of the middle latitudes.

To these might well be added that seeming surface of discontinuity separating the trade-wind system of the Northern Hemisphere and that of the Southern Hemisphere. This one undergoes large variations in

[1] Presented before the meeting of the American Meteorological Society at Berkeley, Calif., June, 1929.